



Chris Parker <chrisparker@utah.gov>

Fwd: Aclara kV2c Meters

Bob Davis <radavis@utah.gov>

Mon, May 14, 2018 at 10:22 AM

To: Chris Parker <chrisparker@utah.gov>

Cc: Artie Powell <wpowell@utah.gov>, Justin Jetter <jjetter@agutah.gov>

Chris,

In response to an information request from one of the Utah Public Service Commission's staff regarding the Aclara meters RMP uses, I provided a public available brochure without further comment.

Bob-

Bob Davis | Utility Analyst

Utah Division of Public Utilities

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----- Forwarded message -----

From: **Bob Davis** <radavis@utah.gov>

Date: Mon, May 14, 2018 at 8:28 AM

Subject: Aclara kV2c Meters

To: John Harvey <jsharvey@utah.gov>

Cc: Justin Jetter <jjetter@agutah.gov>, Artie Powell <wpowell@utah.gov>

John,

Please see the attached meter information for RMP's Aclara meters.

Bob-

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radavis@utah.gov**Aclara-kV2c-Commercial-and-Industrial-Smart-Meter-Family-Brochure-0917.pdf**

905K



Commercial & Industrial Electricity

Versatile Metering for Demanding Applications



Aclara's kV2c meter family is designed for revenue class metering in commercial and industrial applications. The kV2c meter moves beyond revenue metering to real time instrumentation, true power quality monitoring and real cost of service measurements. Whether you are metering the simplest energy rate or collecting critical quality of service and load analysis information on a polyphase or a single phase circuit, there is a kV2c meter configuration to meet your needs.

The Aclara kV2c meter family is one of the most widely accepted ANSI® commercial and industrial meters with over 2 million units deployed in the field since its introduction. The robust revenue-grade meter design is based on Aclara's cutting edge technology that provides high accuracy and reliability.

The Aclara kV2c product family includes 2 models to provide the ultimate in flexibility and customer choice, including a polyphase product available for 600V applications.

Each Aclara kV2c delivers

EACH ACLARA kV2c DELIVERS COMMUNICATIONS

- AMI/AMR options including RF, Power Line Carrier, Cellular Networks, Ethernet
- Allows interchangeability of AMR/AMI plug & play options
- Supports connectivity and integration with 3rd party communications solutions providers Smart Configuration

SMART CONFIGURATION

- Customize advanced metering options to suit customer needs
- Versatile programming softswitches allowing the selection of advanced functionality such as expanded recording features, harmonic analysis, time of use, load profile, and power quality measures.
- Options available to provide totalization capability, pulse outputs, telephone modem, and RS-232/485 communications
- Tamper detection tools and installation verification capabilities to automatically catch errors, wiring changes, tampering, and billing issues.

RELIABILITY

- Robust revenue-grade watt-hour and demand meter with advanced recording options.
- Based on Aclara's high-quality technology, providing 0.2% accuracy and reliability.
- Provide utilities with tools to lower operational cost and provide accurate metering solutions

Commercial and Industrial Meters



kV2c

SOLUTIONS FOR THE MOST DEMANDING APPLICATIONS

Offering the required revenue grade metering functionality and advanced power quality monitoring for polyphase metering



kV2c+

AMI/AMR COMMUNICATION FOR EXTREME CONDITIONS

Ideal for extremely harsh environments, building on our kV2c design and includes a more robust power supply and suitability for 600V applications

RELIABLE METERING

In this dynamic time of regulatory scrutiny and customer engagement, you can be assured of the product and the company behind the product. We have ANSI and ISO certified labs to ensure that our product design and manufacturing processes yield a robust product.

Our testing procedures go well beyond the ANSI and IEC requirements for which we design to, including some of the most aggressive internal standards. We now have included world-class Radio Frequency (RF) communications expertise to ensure that our meter products are hardened to withstand even the harshest of RF environments without sacrificing the quality or integrity of the metrology or the communications technology.

ACCURATE & DEPENDABLE

With an accuracy class of 0.2%, the Aclara KV2 family of meters provides outstanding capabilities for accuracy. Combined with the low starting watts, the utility can have confidence in the metered value and measured electricity usage.

INTEGRITY OF SUPPLY

Having a partner that can provide assurance in supply is critical when a utility begins a mass deployment of meters. Aclara's process focus and rigor around supply chain excellence minimizes the risk to the utility, giving them confidence to manage installation crews and provide accurate scheduling to customers.

BROAD COMMUNICATIONS SUPPORT

The KV2 family has been designed to allow for the interchangeability of AMR/AMI modules and cover the broadest range of possible AMI communication technologies including RF Mesh, Cellular, Power Line and Ethernet. Modules can be added at the Aclara factory, after the fact, or replaced with another compatible module if the meter is redeployed.

ACLARA'S iiDEAS® OPERATIONAL DATA MANAGEMENT PLATFORM

iiDEAS integrates head-end and meter data management into one unified application. iiDEAS aggregates AMI meter data with existing utility applications and offers a single, customizable interface for personnel to access the critical data they need to better manage their distribution infrastructure, optimize operations and improve service reliability.

AMI meter data is significantly enhanced by the aggregation of data from such systems as GIS, OMS, CIS and SCADA. iiDEAS uses standard interfaces such as MultiSpeak and CIM to integrate with these systems. iiDEAS also provides a range of advanced analytics including loss analysis, transformer analysis, voltage analysis and fault detection and localization.



kV2c

Solutions for the Most Demanding Applications

Aclara's most advanced electricity metering product, the kV2c, delivers world class capability around revenue metering and protection, power quality, and cost of service measurements. Designed around a Aclara proprietary data acquisition chip, this product outperforms the market in relation to sampling and data analytics capability.

VERSATILITY

The kV2c meter family is a versatile metering platform for commercial and industrial applications. The kV2c meter offers easy and powerful functional upgrades with a unique combination of softswitches and option boards to meet your metering needs in a rapidly evolving smart metering space. The kV2c starts as a bi-directional, coincident demand meter with five demand measures, real-time pricing, and real time data monitoring.

Softswitches are available to add such functions as TOU, transformer and line loss compensation, power factor, 4 quadrant measurements, instrument transformer correction, and increased recording channels. For a full description of available firmware enhancements, see the attached product specification table.

POWER QUALITY

The kV2c meter offers advanced power quality tools to measure compliance to power quality agreements or gather data to help set power quality requirements. These tools include:

- Programmable sag and swell monitor that logs voltage sag and swell duration down to one cycle, minimum or maximum voltage, coincident current, and date and time of occurrence.
- Voltage and Current THD per phase, TDD (Total Demand Distortion), Distortion Power Factor, Displacement Power Factor, Distortion kVA, and Distortion kVAh (all recordable).
- Harmonic analysis (MeterMate 5.00 and above) plots odd and even harmonic magnitudes and phase angles).
- Programmable diagnostics for voltage imbalance, distortion, current imbalance, reversed polarity, high neutral current. These events may be logged, set an alert, and initiate a call-in.

INVENTORY MANAGEMENT

The kV2c wide range voltage power supply (120V to 480V) combined with the Fitzall™ feature enables a significant meter inventory reduction while covering all applications. Fitzall is a Aclara exclusive tool for commercial and industrial electronic meter inventory reduction, which allows two meter forms, 9S for transformer rated and 16S for self-contained to meter any service type.

FEATURES & BENEFITS

- AMR/AMI Plug and Play designed to accommodate: RF, PLC, Cellular (GPRS/CDMA), Ethernet (See attached table for currently offered factory integrated solutions)
- Complete range of S-base and A-base forms
- 4-quadrant industrial or substation measures
- Powerful functional upgrades provide 4-channel 64 kb, 20-channel 192 kB, or 20-channel 384 kB recording for voltage, current, energy, apparent power, reactive power, distortion power, power factor, THD, TDD, DPF.
- Per phase AC instrumentation (amps, volts, and frequency)



INSTALLATION VERIFICATION AND TAMPER DETECTION

The Site Genie™ Monitor provides a simple, automatic way to catch errors, tampering and wiring changes before billing problems occur. Site Genie also provides the phasor information and diagnostics needed to fix the problems it finds.

COST OF SERVICE MEASUREMENTS

Knowing what it costs to serve a site is a key piece of competitive information for both Generation and Distribution utilities. With modern loads, measuring energy and power factor isn't enough. The kV2c family of meters will simultaneously measure all of the components of service cost (real & reactive - with and without harmonics, distortion, and vector apparent power).

COMMUNICATIONS

The kV2c meter family offers a wide range of AMI communication technologies including RF Mesh, Cellular, Power Line Carrier and Ethernet to support your Smart Grid applications. Additionally, the kV2c family provides "KYZ" and other I/O options to support local energy management solutions typically found in commercial and industrial facilities. The kV2c has a standard AMI interface that allows the capability to transmit all metering data available at the meter through the AMI communication network. See the attached table for a complete listing of AMI technologies that are currently offered as a factory integrated solution into the kV2c meter family.

kV2c+

AMI/AMR Communication for Extreme Conditions

The kV2c+ comes equipped with a more robust power supply to accommodate the additional power requirements of today's AMI communications. This model is also available with a 57 – 120V auto-ranging power supply for low voltage applications or a 600V power supply for 3-phase 3-wire 600 volt distribution applications

RELIABILITY

The kV2c+ Revenue Guard option board powers the meter even when the A phase voltage is lost; any available line-to-line or line-to-neutral voltage will be used. Revenue Guard Plus softswitch enhances Revenue Guard. It preserves billing integrity when a phase voltage is lost on a 4 wire wye service by converting the 3 element meter to "2 ½" element operation. Even with a lost phase voltage, Revenue Guard Plus provides accurate revenue metering.

FEATURES & BENEFITS

- The kV2c+ offers the following features & benefits in addition to those offered with the kV2c:
 - Enhanced power supply to support a variety of AMI technology
 - 57-120V auto-ranging power supply for low voltage applications
 - Ability to serve 600V applications
 - Revenue Guard option preserves billing integrity when a phase voltage is lost
 - Available in Switchboard form (Z base)



MeterMate

Full featured, Secure Metering Software

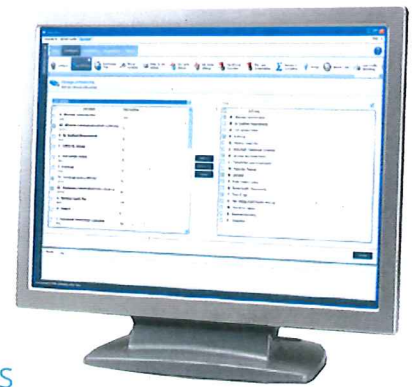
Aclara's innovative MeterMate™ software suite enables meter administrators to easily configure Aclara's meter family. Each software component in the MeterMate suite is optimized to address the different aspects of a meter's life cycle. MeterMate program creation software enables the user to effortlessly configure the meter's basic and advanced functionality, ranging from creating a simple demand program to setting up the meter display to configuring the meter's I/O and alerts. With MeterMate reading and programming software, MM Comm, a user can read, program and perform real-time instrumentation and power quality monitoring on a meter, via a variety of different communication methods: local OPTOCOM™, remote telephone, RS-232/485 and IP communications.

The MeterMate software also supports many functions such as:

- Analysis of load profile data
- Firmware upgrades
- Exporting of meter data to the MV-90 HHF format
- Configuration for automatic remote meter reading
- Direct table reads
- Conversion of meter configuration to an XML file format for AMI over-the-air configuration
- Comparison of a configuration from the database to a configured meter
- Opening and closing the meter service switch
- Importing and exporting of load profile data, event log data, configurations and security codes

FEATURES & BENEFITS

- One software suite to configure and read from the Aclara portfolio of meters: kV family, I-210 family and SGM3xxx family
- Supports the ANSI C12.19 communication protocol
- Multiple methods to communicate with meters: USB & RS232 OPTOCOM, RS485, Modem
- Modular configuration workflow that enable the reuse of frequently used configuration settings and measurements
- Various reports to display information for meter management, auditing, billing and monitoring power quality
- Command line interface and batch-control enabling automated and scheduled meter operations
- Configurable role-based access control security



AMI Integrations

FACTORY INTEGRATED COMMUNICATION OPTIONS FOR kV2c/kV2c+

Aclara's kV2c and kV2c+ meters are integrated with a wide variety of AMI communication modules. Aclara is constantly seeking to provide diverse solutions suitable for each customer's AMI needs. The following table summarizes current factory installed communication options.

AMI Technologies	Type	kV2c		kV2c+	
		120-480V	120-480V EPS	120-480V	600V
Aclara® (UMT-C)	PLC	X			
Aclara Analog Modem	Telephone (landline)	X		X	X
Aclara RSX	RS232 or RS485	X		X	X
Aclara Metrum Cellular	4G LTE cellular		X		
Aclara Synergize RF	RF P2MP		X		
Itron EVDO	Cellular		X		
Itron (53ESS ERT®)	RF (AMR), 900 MHz	X		X	X
L+G Gridstream (Command Center)	RF Mesh, 900MHz		X		
Sensus (FlexNet®)	RF (Tower-based)	X			X
Silver Springs Networks® NIC	RF Mesh, 900 MHz		X		
Trilliant RPMA	RF P2MP		X		
Trilliant (SecureMesh™)	RF Mesh, 2.4 GHz		X		

Technical Specifications

General	
Multifunction Meter	<ul style="list-style-type: none"> Revenue Meter AC Instrumentation Communications
Accuracy	<ul style="list-style-type: none"> ±0.2% at standard test points for energy and demand (typical) Meets ANSI C12.20 Class 0.2
Ratings	<ul style="list-style-type: none"> Voltage: 120 to 480 volts, kV2c+ options: - 57-1230 volts - 600 volts Current: Class 20, Class 200, Class 320 Frequency: 50 or 60 Hz
Operating Range	<ul style="list-style-type: none"> Voltage: 120-480V (+10/-20%) With Enhanced Power Supply: 120-480V (+10/-20%) Frequency: rated (5%) Temperature -40°C to 85°C
Mechanical Design	<ul style="list-style-type: none"> Durable one piece LEXAN™ cover Rugged single action reset lever Magnetic switch activates Alternates Alternate and Site Genie displays
Available Forms	
S-base	CL20: 3S, 4S, 9S, 36S, 45S, 56S CL200: 1S, 2S, 12S, 16S CL320: 2S, 12S, 16S
A-base	CL20: 10A, 36A, 45A, 48A CL150: 13A, 16A
Z-base*	CL20: 3Z, 9Z, 36Z, 45Z
Basic Functions	
No Softswitches	<ul style="list-style-type: none"> Simple Demand Meter Rolling Demand Meter Exponential Demand Meter Coincident Demand Meter Bi-directional Meter Site and Tamper Monitoring Communicating Meter Wiring Analyzer

The kV2c with no softswitches is a bi-directional coincident demand meter	
Accumulators	5 for measurements
Measures	Wh Delivered, Received, Net, or Total (with or without harmonics) and Frequency
Coincident	2 values for each demand from demand list
Power Quality	Diagnostics and Cautions, momentary values
Monitoring	Site Genie, Cautions (8), Diagnostics, Errors
Real Data	Voltage, Current, and Frequency
Recording	Self Reads recording
Display	75 Items
Data	Prior Reset
Logging	# Outages, # Demand Resets, # Programmed, # Comm sessions
RTPs	Real-time price available if I/O board or AMI module present

Multifunction Meter	
With Softswitches	<ul style="list-style-type: none"> kVA, kvar Demand Meter Q-Hour Meter "Real-Time-Pricing" TOU Meter Interruptible Rate Meter 20-Channel Recorder Current Recorder Power Quality Meter Sag and Swell Monitor 200-Event Power Quality Log Real Time Multifunction Instrument Phasor Meter Loss and Accuracy Compensation 4-Channel Recorder Voltage Recorder Totalizing Meter Bi-directional Meter

Technical Specifications (continued)

Softswitches Add	
B Switch	By Quadrant measurements
C Switch	Call in on Outage (Modem)
E Switch	500 Event log
G Switch*	Revenue Guard Plus
H Switch	Expanded Flash Memory (20-channel, 384 kB)
I Switch	Instrument Transformer Correction
K Switch	kVA – Power Factor, kvar and kVA measures
L Switch	Transformer Loss Compensation
M Switch	Expanded Measures – per phase measurement
N Switch	Demand Measures
Q Switch	Power Quality Measures
R Switch	Basic Recording (4-channel, 64 KB)
T Switch	Time of Use)
V Switch	Fast Voltage Event Monitor and Log (sag and swell, 1 to 65k cycles)
W Switch	Waveform Capture (70 samples sets – 6 measures per set – V & I per phase))
X Switch	Expanded Recording (20 channel, 192 kB))
Z Switch	Totalization

Recording	
<ul style="list-style-type: none"> No option board required since recording is a softswitch-enabled function. However, a battery is required to maintain time during power outages. 	
<ul style="list-style-type: none"> Activating recording adds time stamping to the meter's logs (adding TOU is an alternative way to add time stamping). 	
<ul style="list-style-type: none"> Recording memory is configurable; the number of channels and length of channels is programmable. 	
<ul style="list-style-type: none"> Adding recording also adds 12 self reads. 	
<ul style="list-style-type: none"> No Load Profile (R or X) Softswitch is required for Self Reads 	
Types of Recording	<ul style="list-style-type: none"> Load Profile Data: <ul style="list-style-type: none"> Maximum value in interval Minimum value in interval End of interval value

R Switch (Basic Recording, 64 kB)				
Basic Recording - 4 Channels of data Days of Recording by Interval and Channels (4 Ch).				
	1 Ch	2 Ch	3 Ch	4 Ch
1 Min	14.6	7.3	5.5	4.0
5 Min	73.0	36.7	27.3	20.0
15 Min	219.0	110.0	82.0	60.0
30 Min	438.0	220.0	164.0	120.0
60 Min	876.0	440.0	328.0	240.0

X Switch (Additional Recording, 192 kB)				
Expanded Recording - 4 Channels of data Days of Recording by Interval and Channels (20 Ch).				
	1 Ch	5 Ch	10 Ch	20 Ch
1 Min	43.8	10.2	5.1	2.6
5 Min	219.0	51.0	25.3	13.0
15 Min	675.0	153.0	76.0	39.0
30 Min	1314.0	306.0	152.0	78.0
60 Min	2628.0	612.0	304.0	156.0

H Switch (Additional Recording, 384 kB)				
Expanded Recording - 20 Channels of data Days of Recording by Interval and Channels (20 Ch).				
	1 Ch	5 Ch	10 Ch	20 Ch
1 Min	87.6	20.4	10.3	5.2
5 Min	438.0	102.0	50.6	26.0
15 Min	1350.0	306.0	152.0	78.0
30 Min	2628.0	612.0	304.0	156.0
60 Min	5256.0	1224.0	608.0	312.0

Option Board	
SIO – Simple I/O	<ul style="list-style-type: none"> 2 Form C Outputs RTP Input 1 Form A Output
MIO – Multifunction I/O Board	<ul style="list-style-type: none"> 2 Form C Outputs. Outputs programmable as: <ul style="list-style-type: none"> Pulse Data Load Control Diagnostic and Caution Alerts EOI 4 Form A or C Inputs for recording and Totalization 6 Form A Outputs RTP Input
T1 – Telephone Modem	<ul style="list-style-type: none"> Call in during outage with C Softswitch and battery Communications up to 2400B Suitable for outdoor installation Wide temperature range -20 to +75C Line sharing, up to 5 T1 modems on a phone line MV90 compatible 3 phone numbers Supports on-line read data with MeterMates Call-in and call-out windows
RSX – Serial Communications Board	<ul style="list-style-type: none"> RS-232 communications to 9600B External modems or wireless modems Simple Serial/RS-232 drive for devices within 50 feet Simple Serial/RS-485 drive for devices within 3500 feet
Revenue Guard Board*	<ul style="list-style-type: none"> Preserves billing integrity when A-Phase voltage is lost*

Security Log
• Total number of outages
• Cumulative power outage duration.
• Date & Time of last demand reset (TOU only).
• Total number of times programmed.
• Date & Time of last RTP
• Total number of RTP activations
• Date & Time of last programmed
• ID of last programmer
• Date & Time last calibrated
• ID of last calibrator
• Total number of OPTOCOM communications
• Date & Time of OPTOCOM communication
• Number of EEPROM reads and writes

Technical Specifications (continued)

Display	
• Alphanumeric display	
• Programmable labels (3).	
• Blinking block disk analog	
• Arrows show energy flow direction and lagging or leading Quadergy.	
• Separate indicator for each phase voltage	
• Active TOU rate indicator	
• Three to six digits for demand and energy displays with zero to four digits after the decimal	
• 70 displayable items from list of over 910 possible items including current billing period, previous period and previous season data, previous Self Reads	
• Programmable display time	
• Programmable 3-digit display identifiers	
• Programmable display order	
Disk Analog Scroll	• Boxes represent 60%, 70%, 80%, 90% positions • At 100% all boxes turn off
Display Mode	• Normal • Test • Cautions and Errors
Test Mode	• Programmable time out • Test switch under cover • Special test mode displays • Watthour accumulation • Prior subinterval demand • Max demand since entering the test • Time remaining in subinterval • Instantaneous demand • Test pulses available from OPTOCOM port except when communicating
Types of Recording	• Load Profile • Data: – Maximum value in interval – Minimum value in interval – End of interval value

Site Genie	
Alerts and Diagnostics:	
• Polarity, cross phase, reverse flow	
• Phase voltage alert	
• Inactive phase current	
• Phase angle alert	
• Distortion alert (Total, A, B, C)	
• High neutral current	
• High Demand	
• Over and Under Voltage	
Phasor Information::	
• VRMS per phase	
• IRMS per phase	
• Voltage phase angles	
• Current phase angle	
• Number of EEPROM reads and writes	

Service Determination	
Meter Automatically determines service by sensing voltage phase angles at Power Up (After any outage) and 10 Minutes after Power Up. It can also be programmed to check service:	
• Daily (programmable)	
• Service Error displayed if wired improperly	
• After demand reset (programmable)	
• Optional service determination at demand reset\	
•kV2c can be programmed to a fixed Service using Fitzall	

Option Board	
Alerts and Counters	• Distortion alert with counter • High neutral current alert with counter • High demand alert • DC detection alert • Over voltage alert with counter • Outage counter • Date & time of last outage (TOU or recording) • Power factor alert • Under voltage alert with counter
Instantaneous Measures	• Per Phase Voltage • V&I Phase Angles • Reactive power • Distortion power factor (D/U) • Per Phase Current • Active power • Power factor
Cumulative Measures	• Distortion kVAh (with k Switch) • Cumulative power outage duration
Advance Power Quality	• Voltage, Current, Frequency, THD, TDD, DPF Recorded as Min, Max, average (V2h or I2h) or end-of-interval (4 or 20 channels)
Distortion – Real Time and Cumulative Measures*	• Distortion kVA and kVAh • Distortion Power Factor (DPF) = Distortion Power/Apparent Power per phase and total • Total Demand Distortion (TDD) = Total Harmonic Current / Rated Maximum Current per phase • Total Harmonic Distortion (THD) - Current and Voltage per phase
Instrumentation – Real Time measures	• Frequency • RMS Voltage (L-N) or (L-L) primary or secondary • Fundamental per phase voltage, current, and phase angles
Voltage Monitor	• Softswitch enabled • Two types of events independently monitored • Voltage Sags per phase • Voltage Swells per phase • Programmable Magnitude and duration thresholds • 0 to 100% in 1% steps (separate sag and swell thresholds) • 1 to 65 k cycles • Event ends when all phases within threshold • Reference voltage automatically determined or programmed
Voltage Event Log	• Separate Sag and Swell event counters • Date and Time • RMS coincident current • Max (Swells) or Min (Sags) RMS cycle voltage for each phase • Duration in cycles • 200 events in log
Waveform Capture	• 70 sample sets in memory @ 60 Hz • 325.2 samples per cycle • 54.2 sample sets per cycle • Each sample set includes 3 voltage and 3 current samples (Phases A, B, and C) • Waveform data used for harmonic analysis by MeterMate • Data capture initiated by local or remote read

Technical Specifications (continued)

Diagnostics and Cautions
• Diagnostic 1 – Polarity, Cross Phase, Reverse Energy Flow
• Diagnostic 2 – Voltage Imbalance.
• Diagnostic 3 – Inactive Phase Current
• Diagnostic 4 – Phase Angle Alert.
• Diagnostic 5 – High Distortion, DC detection
• Diagnostic 6 – Under Voltage, Phase A
• Diagnostic 7 – Over Voltage, Phase A
• Diagnostic 8 – High Neutral Current
• Caution 000400 – Under Voltage
• Caution 000400 – Demand Overload
• Caution 000400 – Leading kvarh
• Programmable duration before activation – 5 seconds to 14 minutes

Diagnostics and Cautions
• Phasor Diagram of current circuit conditions (current and voltage magnitude phase angles, and phase rotation)
• 3 phase L-L and L-N RMS Voltage with and without harmonics.
• RMS per phase and imputed neutral current with and without harmonics
• Frequency.
• Power Factor with and without harmonics
• Current and Voltage THD per phase
• TDD (Harmonic current/Max. current) per phase
• Active, Reactive, Phasor, Distortion, Arithmetic Apparent and Vector Apparent Power with and without harmonics (also by quadrant and phase i.e., delivered, received, lagging, and leading; phase A, B, C). Unidirectional (delivered plus received or lagging plus leading) and detented measurement (delivered minus received or lagging minus leading)
• Automatic Service Detection, Installation Check, Circuit Monitoring and Tamper Detection – Circuit Diagnostics and Cautions
• ID of last programmer
• Date & time of last calibrated
• ID of last calibrator
• Total number of OPTOCOM communications
• Date & time of last OPTOCOM communication
• Number of EEPROM reads and writes

Measurement Choices
• Measure fundamental only or fundamental plus harmonics
• Demand measures
• kWh
• kvar IEEE®.
• Q-hour
• “Fuzzy” vars
• Demand calculations
• Maximum, cumulative, or continuously cumulative
• Block
• Rolling
• Exponential (thermal emulation)
• Intervals
• Active, Reactive, Phasor, Imaginary (“Fuzzy”), Arithmetic, and Vector Apparent Power with and without harmonics (also by quadrant and phase i.e., delivered, received, lagging, and leading)
• Thermal Demand emulation
• Q-Hour Demand (note: not reactive)
• Coincident demands (up to 10)
• Average Power Factor (distortion and active power factors)
• Instantaneous, Block, Rolling (Sliding Window), Cumulative, and Continuously Cumulative demand by TOU period, season, present, and past billing period Demand intervals from 1 to 60 minutes
• Up to 20 values can be recorded with up to 4 totalized channels, including 4 external input channels for recording values from external devices (min, max, sampled, and interval count recording)
• High demand alert and end of demand interval output pulses

Diagnostics and Cautions
• ANSI C12.1 – Electricity metering
• ANSI C12.10 – Watt-hour meters.
• ANSI C12.16 – Solid-state meters
• ANSI C12.18 – Protocol Specification for ANSI Type II optical ports.
• ANSI C12.19 – Utility Industry End Device Data Tables
• ANSI C12.20 for 0.2 and 0.5 accuracy class meters
• FCC Class B emissions (Class A for kV2c+)
• ANSI C12.21 for Modem Communication

Aclara is a world-class supplier of smart infrastructure solutions (SIS) to more than 800 water, gas, and electric utilities globally. Aclara SIS offerings include smart meters and other field devices, advanced metering infrastructure and software and services that enable utilities to predict and respond to conditions, leverage their distribution networks effectively and engage with their customers. Aclara is owned by an affiliate of Sun Capital Partners. Visit us at Aclara.com, phone 800 297 2728 or contact us at info@aclara.com and follow us on [Twitter @AclaraSolutions](https://twitter.com/AclaraSolutions).